



Fracture of the fibular sesamoid bone of the metatarsophalangeal joint of the big toe

Fracture of the fibular sesamoid

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Abstract

Fractures of the sesamoid bone in the metatarsophalangeal joint are seen more rarely than fractures of other foot bones. Therefore, studies in the literature are very limited in number. When a problem has been determined in the sesamoid bone, it is important to decide if it is an acute fracture or a bipartite sesamoid injury. In cases of medial forefoot pain in the Emergency Department, injuries to the sesamoid bones of the big toe should be evaluated in the differential diagnosis.

Keywords

Sesamoid; Treatment; Fracture

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Introduction

The bony structure of the metatarsophalangeal (MTP) joint is in the form of a rounded metatarsal head and a concave phalanx and these bone structures provide some support to the joint stability, which is mainly due to the ligaments and complex structure of the joint capsule, which is normally thin and weak on the dorsal aspect [1]. The plantar capsule is thick, weight-bearing and structurally strong against the pressure of the proximal phalanx. Two bones are located within this plantar structure, known as the sesamoid bones, which are directly articulated with the metatarsal head. The medial and lateral are the two contact points allowing the head of the 1st metatarsal to make contact with the ground. The sesamoid bones are oval in shape, resembling a grain of wheat. Often they have not completed ossification and include cartilage and fibrous tissue at various rates [1,2]. Fractures of the sesamoid in the big toe are seen less often than fractures of the other bones of the foot [2]. The mechanism of injury of these bones is severe hyperextension or abduction of the big toe or less frequently may be a direct injury [3].

The case is here presented of a fracture in the fibular sesamoid bone of the metatarsal joint of the big toe and the mechanisms of injury of these fractures and difficulties encountered in diagnosis are discussed.

Case Report

A 27-year old female presented to the Emergency Department with complaints of pain and swelling in the left foot plantar surface following a fall from a stool with the ankle in plantar flexion. In the physical examination, there was swelling at the level of the 1st MTP joint in the left foot. There was a limitation in passive and active dorsiflexion of the MTP joint, and with palpation there was a pain in the plantar surface of the 1st MTP joint, more predominantly in the forefoot.

On the anterior-posterior and lateral radiographs were taken, a fracture in the fibular sesamoid was determined (Figures 1, 2). To make a differential diagnosis with bipartite sesamoid, computed tomography (CT) was taken of the foot (Figure 3). A fragmented fracture in the fibular sesamoid of the 1st MTP joint was observed. A short-leg plaster cast was applied which prevented dorsiflexion of the 1st MTP joint, provided support to the middle of the foot and prevented weight-bearing on the forefoot. Immobilisation was applied for 4 weeks, at the end of which the plaster cast was removed. In the subsequent examination, there were no other findings apart from the pain in excessive dorsiflexion of the 1st MTP joint. For a further 3 weeks, the use of soft-heeled shoes was recommended to prevent dorsiflexion of the metatarsophalangeal joint. At the 2-month follow-up examination, all the complaints of the patient were seen to have recovered.

Discussion

The sesamoid bones in the foot, comprise two bones, the tibial and fibular, most commonly in the 1st MTP [1,3]. Occasionally sesamoid bones may be found below the second, third, fourth and fifth metatarsal heads or within the peroneus longus, tibialis anterior or tibialis posterior tendons [1,4]. The sesamoid bones adjacent to the 1st MTP function as shock absorbers to-



Figure 1. Anterior-posterior direct radiograph of the foot



Figure 2. Lateral direct radiograph of the foot

gether with the joint complex and act as a lever in the weight-bearing function of the big toe. Furthermore, the positions on both sides of the flexor hallucis longus tendon create a tunnel facilitating movement of the tendon [5].

Included in injuries of the sesamoid bone are various diagnoses such as sesamoiditis, stress fracture, turf toe, plantar-plate disruption and acute traumatic fracture. The mechanism of injury occurs in various ways. Turf toe injury typically describes an injury to the metatarsosesamoid complex of the hallux generally caused by a hyperextension force to the great toe. This injury may be accompanied by pain, deformity, and decreased athletic performance [6]. While acute traumatic fractures may occur with severe axial loading and abduction, stress



Figure 3. Axial CT slice of the foot showing the fibular sesamoid bone fracture

the foot should be moved into mild pronation [5]. In the evaluation of the tibial sesamoid bone, a medial oblique sesamoid image is helpful. The fibular sesamoid bone is evaluated best on a lateral oblique radiograph. Taking an additional axial sesamoid radiograph is extremely useful in identifying narrowing of the joint space and sclerosis associated with osteochondritis of the sesamoid.

CT and bone scintigraphy examinations are thought to be helpful in confirming the diagnosis, but recent studies have shown low specificity of bone scintigraphy in sesamoid injuries and have reported that CT imaging is more helpful in the diagnosis of these injuries [5-8]. There may be non-fusion of one or more ossification centers during the formation of the sesamoid bone, and this increases the possibility of 'partite'. A bipartite sesamoid bone may be confused with sesamoid bone fractures. Partite formation in the tibial sesamoid bone is 10-fold greater than in the fibular sesamoid bone. The likelihood of bilaterality ranges from 25% to 85% [5]. Therefore, bilateral direct radiographs must be taken when making the differential diagnosis. However, bilateral bipartite sesamoid bones do not confirm that there is not a sesamoid fracture in the other foot. There are some criteria for the differentiation of unilateral symptomatic bipartite sesamoid fracture from sesamoid bone fractures. While fragments have a tendency to divide into roughly equal size in sesamoid bone fractures, in a bipartite sesamoid, one part is large and the other small [4,5]. In addition, bipartite sesamoid bones tend to be smooth with round borders, whereas in sesamoid bone fractures there is an irregular, sharp delineation.

Conclusion

Fibular sesamoid fractures in the foot are rarely seen, and direct radiographs obtained in appropriate positions are useful in the diagnosis of these fractures. CT examination can contribute to the diagnosis in cases when the differential diagnosis is

insufficient due to the presence of a bipartite sesamoid bone. It must not be forgotten that the possibility of an injury to the sesamoid bones could be an underlying cause of medial foot pain.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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